CLAIMS

1. A method for producing an image with a computed tomography imaging system having an x-ray source that moves around a region of interest in a path $\vec{y}(t)$ and a detector which receives x-rays passing through the region of interest along a path $\vec{r}$, the steps comprising:

a) acquiring a set of projection data $g(\vec{r}, \vec{y}, (t))$ which measures the x-ray attenuation of a subject in the region of interest;

b) calculating the derivative of the acquired projection data with respect to the x-ray source trajectory;

c) convolving the derivative data with a kernel function;

d) performing a weighted backprojection of the convolved data;

e) adding the backprojected data to an image; and

f) repeating steps a) though e) a plurality of times as the x-ray source moves around the subject.

2. The method as recited in claim 1 where the kernel function is $1/\hat{\beta}^{\perp} \cdot \hat{r};$.

3. The method as recited in claim 1 where the weighting in step d) is $1/\hat{\beta}^{\perp}, \vec{x}; t)\operatorname{sgn}\left[\vec{\beta}^{\perp} \cdot \vec{y}'(t)\right] / |\vec{x} - \vec{y}(t)|$.

4. A method for producing an image with a computer tomography imaging system having an x-ray source that moves in a circular path around a region of interest and a detector array which receives a fan beam of x-rays passing through the region of interest, the steps comprising:

a) acquiring a set of projection data which measures the x-ray attenuation of a subject in the region of interest at one view angle of the x-ray source and detector array;

b) filtering each acquired set of projection data with a first filter;

c) backprojecting each resulting filtered view $Q_1(\theta)$ with a first weight;

d) adding the backprojected data to the image;

e) filtering each acquired set of projection data with a second filter;

f) backprojecting each resulting filtered view $Q_2(\theta)$ with a second weight;

g) adding the backprojected data from step f) to the image; and

h) repeating steps a) though g) as the x-ray source is moved around the circular path.

5. The method as recited in claim 4 in which the x-ray source moves less than 180^{o} around the circular path during the production of the image and the minimum number of degrees of movement needed to complete the image is determined by the size of an object to be imaged in the region of interest.

6. The method as recited in claim 4 in which the first filter is $1/\sin(\gamma-\gamma_m/2)$.

7. The method as recited in claim 6 in which the second filter is $1/\sin^2(\gamma-\gamma_m/2)$.

8. The method as recited in claim 7 in which the first weight is $\dfrac{w'(\vec{x},t)}{|\vec{x}-\vec{y}(t)|}$.

9. The method as recited in claim 8 in which the second weight is $\dfrac{Rw(\vec{x},t)}{|\vec{x}-\vec{y}(t)|^2}$.

10. The method as recited in claim 4 in which the first filter is $1/\sin(\gamma-\gamma_m/2)$.

11. The method as recited in claim 10 in which the second filter is $\cos(\gamma-\gamma_m/2/[\sin(\gamma-\gamma_m/2)*\sin(\gamma-\gamma_m/2)]$.

12. The method as recited in claim 11 in which the first weight is $W'(\vec{x},t)/|\vec{x}-\vec{y}(t)|$.

13. The method as recited in claim 12 in which the second weight is $RW(\vec{x},t)/|\vec{x}-\vec{y}(t)|$.